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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/509,935	08/19/2005	Serdar Saricifici	15626-011US1	4312

26161 7590 10/28/2008
FISH & RICHARDSON PC
P.O. BOX 1022
MINNEAPOLIS, MN 55440-1022

EXAMINER	
BERDICHEVSKY, MIRIAM	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
10/28/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATDOCTC@fr.com

Office Action Summary	Application No.	Applicant(s)	
	10/509,935	SARICIFTCI ET AL.	
	Examiner	Art Unit	
	MIRIAM BERDICHEVSKY	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *RCE 8/22/2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10,12-20 and 22-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,12-20 and 22-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/22/2008 has been entered.

Remarks

Claims 1 and 10 are amended. Claims 11 and 21 are cancelled. Claims 1-10, 12-20 and 22-24 are currently pending.

Status of Objections and Rejections

The rejection of claims 19-20 and claims 22-24 from the previous office action is maintained.

All other rejections from the previous office action are withdrawn in view of Applicant's amendment. New grounds of rejection under 35 U.S.C 103(a) are necessitated by the amendments.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-10 and 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cravino (as cited in the IDS) in view of Sentein (as cited in the IDS) and in view of Zhao (as cited in the IDS) with supporting evidence provided by Dittmer (*Electron Trapping in Dye/Polymer Blend Photovoltaic Cells*) and further in view of Gebeyehu (*Characterization of large area flexible plastic solar cells based on conjugated polymer/fullerene composites*).

As to claims 1 and 10, Cravino teaches a photovoltaic cell comprising,

- A photoactive region and two metal electrodes (p-type/n-type between anode and cathode, Figure 1),
- The photoactive layer comprising a conjugated polymer component (electron donor) and a fullerene component (electron acceptor) (section 5, ¶ 1), and
- The two metal electrodes provided on either side of the photoactive layer (p- type/n-type between anode and cathode, Figure 1).

Cravino is silent to a method for the post treatment of a photovoltaic cell comprising:

- Subjecting the photovoltaic cell to heat treatment above a glass transition temperature of the conjugated polymer for a predetermined treatment time,
- The heat treatment of the photovoltaic cell being carried out for at least a portion of the treatment time under the influence of an electric field induced by a field voltage applied to the electrodes of the photovoltaic cell and exceeding a no-load voltage thereof.

Sentein teaches a method for the post treatment of a photovoltaic cell comprising:

- Subjecting the photovoltaic cell to heat treatment near a glass transition temperature of the conjugated polymer for a predetermined treatment time (section 1, ¶ 2),
- The heat treatment of the photovoltaic cell being carried out for at least a portion of the treatment time under the influence of an electric field induced by a field voltage applied to the electrodes of the photovoltaic cell and exceeding a no-load voltage thereof (section 1, ¶ 2; section 5, ¶ 1). Where 5 to 10 V clearly exceeds a no-load voltage.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the fullerene/polymer system of Sentein in Carvino because fullerenes have an extended delocalized rr-electron source and lead to the cost effective fabrication of flexible large area solar cells, as taught by Sentein (section 1, ¶ 1).

Neither Cravino nor Sentein teach the heat treatment being above a glass transition temperature of the conjugated polymer.

Zhao teaches a heat treatment being above a glass transition temperature (Tg) of the conjugated polymer (Results section, ¶ 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Cravino and Sentein by increasing the heating temperature to above the Tg of the conjugated polymer as taught by Zhao because an enhanced crystallization of the polymer can be obtained, as taught by Zhao (Results section, ¶ 4), along with this enhanced crystallization comes increases in hole mobility as seen by the supporting evidence provided by Dittmer (page 1273, ¶ 1).

Cravino, Sentein and Zhao are silent to the conjugated polymer (donor) and fullerene (acceptor) being different compounds.

Gebeyehu teaches the use of conjugated polymer and fullerene composites which are favorably tuned by an electric field (section I, ¶ 4 and section 2, ¶3).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the separate fullerene (acceptor) and conjugated polymer (donor) of Gebeyehu in modified Cravino because these systems are based on ultrafast, reversible, metastable photoinduced electron transfer and charge separation, as taught by Gebeyehu (abstract).

Regarding claim 2, modified Cravino teaches that the electric field is induced via a field voltage that exceeds the no-load voltage of the photovoltaic cell by at least 1 V (Sentien: section 5, ¶ 1). Where 5 to 10 V clearly exceeds a no-load voltage.

Regarding claim 3, neither Cravino nor Sentein explicitly teach application of a field voltage between 2.5 and 3 V.

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply a voltage between 2.5 and 3 V, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F. 2d 272,205 USPQ 215 (CCPA 1980), especially in light of the fact that the current/voltage experiments were performed for a broad range of values as seen in Sentein (Figure 5).

Regarding claim 4-9, neither Cravino nor Sentein explicitly teach that the invention as to claim 1 or claim 2 or claim 3 is subjected for between 2 and 8 min (claims 4-6) or between 4 and 5 min (claims 7-9); to heat treatment under the influence of an electric field.

It would have been obvious to one of ordinary skill in the art at the time of the invention to have subjected the cell to heat treatment for between 2 and 8 minutes (claim 4-6) or between 4 and 5 minutes (claims 7-9) since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F. 2d 272,205 USPQ 215 (CCPA 1980), especially in light of the fact that the time scale used during experimentation is of the same order of magnitude (min) as seen in Sentein (Figure 6) and as seen in Zhao (10 min) (experimental, ¶ 1).

Regarding claim 12, Cravino and Sentein are silent to heating above a glass transition temperature of the electron donor.

Zhao teaches heating above a glass transition temperature of the electron donor (conjugated polymer) (Results section, ¶ 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to increase the heating temperature to above the Tg of the conjugated polymer as taught by Zhao because an enhanced crystallization of the polymer can be obtained, as taught by Zhao (Results section, ¶ 4), along with this enhanced crystallization comes increases in hole mobility as seen by the supporting evidence provided by Dittmer (page 1273, ¶ 1).

Regarding claim 13, the reference teaches that the electric field is formed by applying a field voltage to the first and second electrodes (Sentien: section 2, ¶ 3).

Regarding claim 14, the reference teaches that the electric field exceeds a no-load voltage of the photovoltaic cell (Sentien: section 5, ¶ 1). Where 5 to 10 V clearly exceeds a no-load voltage because the open current voltage of single junction cells are typically of the order of 1 V or less.

Regarding claims 15 and 22, the reference teaches that the electric field exceeds the no-load voltage by at least 1 V (Sentien: section 5, ¶ 1). Where 5 to 10 V clearly exceeds a no-load voltage.

Regarding claim 16, Sentein suggests application of a field voltage between 2.5 and 3 V.

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply a voltage between 2.5 and 3 V, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in

the art. In re Boesch, 617 F. 2d 272,205 USPQ 215 (CCPA 1980), especially in light of the fact that the current/voltage experiments were performed for a broad range of values as seen in Sentein (Figure 5).

Regarding claims 17-18, Sentein and Zhao teache that the photovoltaic cell is subjected for between 2 and 8 min (claim 17) or between 4 and 5 min (claims 18); to heat treatment under the influence of an electric field.

It would have been obvious to one of ordinary skill in the art at the time of the invention to have subjected the cell to heat treatment for between 2 and 8 minutes (claim 17) or between 4 and 5 minutes (claim 18) since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F. 2d 272,205 USPQ 215 (CCPA 1980), especially in light of the fact that the time scale used during experimentation is of the same order of magnitude (min) as seen in Sentein (Figure 6) and as seen in Zhao (10 min) (experimental, ¶ 1).

5. Claims 19-20 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cravino in view of Sentein and further in view of Zhao with supporting evidence provided by Dittmer.

As to claims 19 and 24, Cravino teaches a photovoltaic cell comprising,

- A photoactive region and two metal electrodes (p-type/n-type between anode and cathode, Figure 1),
- The photoactive layer comprising a conjugated polymer component (electron donor) and a fullerene component (electron acceptor) (section 5, ¶ 1), and

- The two metal electrodes provided on either side of the photoactive layer (p- type/n-type between anode and cathode, Figure 1).

Cravino is silent to a method for the post treatment of a photovoltaic cell comprising:

- Subjecting the photovoltaic cell to heat treatment above a glass transition temperature of the conjugated polymer for a predetermined treatment time,
- The heat treatment of the photovoltaic cell being carried out for at least a portion of the treatment time under the influence of an electric field induced by a field voltage applied to the electrodes of the photovoltaic cell and exceeding a no-load voltage thereof.

Sentein teaches a method for the post treatment of a photovoltaic cell comprising:

- Subjecting the photovoltaic cell to heat treatment near a glass transition temperature of the conjugated polymer for a predetermined treatment time (section 1, ¶ 2),
- The heat treatment of the photovoltaic cell being carried out for at least a portion of the treatment time under the influence of an electric field induced by a field voltage applied to the electrodes of the photovoltaic cell and exceeding a no-load voltage thereof (section 1, ¶ 2; section 5, ¶ 1). Where 5 to 10 V clearly exceeds a no-load voltage.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the fullerene/polymer system of Sentein in Carvino because fullerenes have an extended delocalized rr-electron source and lead to the cost effective fabrication of flexible large area solar cells, as taught by Sentein (section 1, ¶ 1).

Neither Cravino nor Sentein teach the heat treatment being above a glass transition temperature of the conjugated polymer.

Zhao teaches a heat treatment being above a glass transition temperature (Tg) of the conjugated polymer (Results section, ¶ 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Cravino and Sentein by increasing the heating temperature to above the Tg of the conjugated polymer as taught by Zhao because an enhanced crystallization of the polymer can be obtained, as taught by Zhao (Results section, ¶ 4), along with this enhanced crystallization comes increases in hole mobility as seen by the supporting evidence provided by Dittmer (page 1273, ¶ 1).

Further regarding claim 19, the reference teaches applying a field voltage to the first and second electrodes and the electric field exceeds a no-load voltage of the photovoltaic cell (Sentein: section 2, ¶ 3; section 5, ¶ 1). Where 5 to 10 V clearly exceeds a no- load voltage. However, neither Cravino nor Sentein explicitly teach that the invention is subjected for between 2 and 8 min (claim 19); to heat treatment under the influence of an electric field.

It would have been obvious to one of ordinary skill in the art at the time of the invention to have subjected the cell to heat treatment for between 2 and 8 minutes

(claim 19) since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F. 2d 272,205 USPQ 215 (CCPA 1980), especially in light of the fact that the time scale used during experimentation is of the same order of magnitude (min) as seen in Sentein (Figure 6) and as seen in Zhao (10 min) (experimental, ¶ 1).

Further regarding claim 24, the reference teaches simultaneously injecting charge carriers into the photovoltaic cell via at least one electrode selected from the group consisting of the first and second electrode. Application of the field will inherently, inject charge carriers.

Regarding claim 20, Cravino teaches that the photoactive layer comprises an electron donor and an electron acceptor (section 2, ¶ 1).

Regarding claim 22, Cravino teaches that the electric field exceeds the no-load voltage by at least 1 V (Sentien: section 5, ¶ 1). Where 5 to 10 V clearly exceeds a no-load voltage.

Regarding claim 23, Sentein teaches that the photovoltaic cell is subjected for between 4 and 5 min (claim 23); to heat treatment under the influence of an electric field.

It would have been obvious to one of ordinary skill in the art at the time of the invention to have subjected the cell to heat treatment for between 4 and 5 minutes (claim 23) since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F. 2d 272,205 USPQ 215 (CCPA 1980), especially in light of the fact that the time scale used during

experimentation is of the same order of magnitude (min) as seen in Sentein (Figure 6) and as seen in Zhao (10 min) (experimental, ¶ 1).

Response to Arguments

4. Applicant's arguments with respect to claims 1-10 and 12-18 have been considered but are moot in view of the new ground(s) of rejection as necessitated by amendment.

5. Applicant's arguments regarding claims 19-20 and 22-24 filed 8/22/2008 have been fully considered but they are not persuasive. Applicant's arguments that enhanced crystallinity does not occur at higher temperatures. The Examiner respectfully disagrees and has provided supporting evidence that enhanced crystallinity due to thermal annealing results in increasing hole mobility as discussed above in relation to Zhao and Dittmer.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **MIRIAM BERDICHEVSKY** whose telephone number is (571)270-5256. The examiner can normally be reached on M-Th, 10am-8pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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